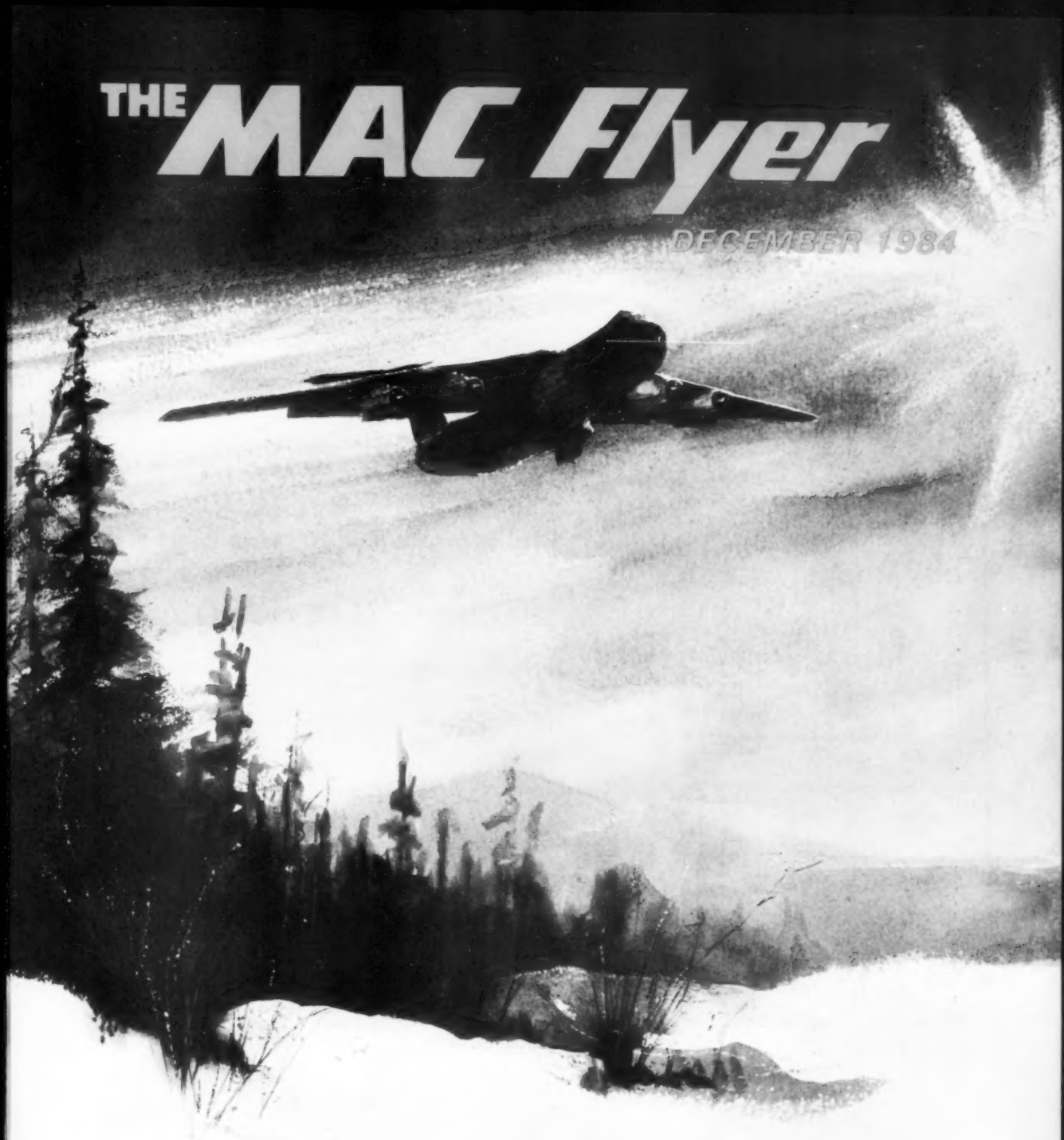
THE MAC Flyer

DECEMBER 1984



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Tom O'Loughlin

THE MAC Flyer

For Greater Safety in MAC Air Operations

DECEMBER 1984 | MACRP 127-5 | VOL XXXI NO.12

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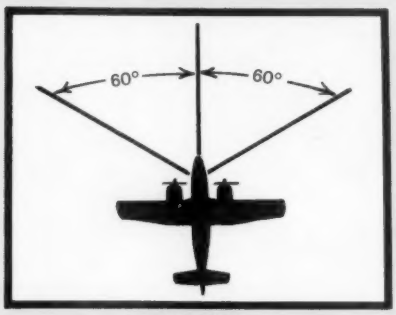

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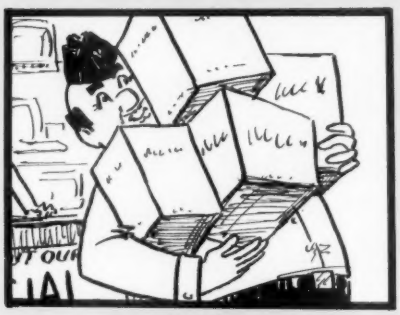

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The MAC Flyer is published by the Director of Safety, Military Airlift Command. The contents are informative and not regulatory or directive. Names of people and places in mishap stories are representative and not necessarily of the aircraft or equipment involved. Information in any article may not be construed as incriminating under Article 31, UCMJ.

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General Ryan's 1984 Christmas Message

As we approach the holiday season, we have reason to feel proud of our accomplishments during the past 15 months, for it has been a truly exciting time for each of us in MAC. Looking back, I'd like to review some of the high points with you. Without a doubt, the most significant event of this period was Operation URGENT FURY, the rescue of American medical students on Grenada. Not only did MAC units play a vital role in planning and executing this mission, but each one performed superbly. Everyone in MAC was essential to the success of this daring rescue and I salute your skill, dedication and courage! Your outstanding performance in URGENT FURY demonstrated to the nation and the world that we are well trained, well prepared and capable of performing our diverse missions worldwide.

This has also been a banner year for the acquisition and development of new equipment. Since January, we've added the C-20A, Gulfstream III; the C-21A, Lear 35A; the C-12F, Beechcraft B200C; and the C-23A, Shorts Sherpa to our inventory. The C-5B production is on schedule, with the first aircraft scheduled for delivery in late 1985. We have also improved the capabilities of our strategic airlift and special operations forces through the ongoing C-5A wing-mod program and the acquisition of new MC-130 Talon IIs. Equally important, the Sikorsky HH-60D Night Hawk rescue helicopter is undergoing flight testing and the McDonnell-Douglas C-17 is ready to enter full-scale engineering. In short, we've taken great strides in our force modernization program.

We need continued emphasis on flight safety, though. Our record in 1984 is good, but unfortunately not up to the standards we set in 1983 when we recorded the best flight safety record in the command's history. Therefore, I challenge each of you—commanders, aircrews and support personnel—to insure we are not exposing our people or equipment to unnecessary hazards. By emphasizing safety and working together to identify and eliminate deficiencies in training, equipment and procedures, we can perform every one of our missions safely and efficiently.

Finally, I'd like each of you to look ahead to 1985, because the new year will provide equally demanding challenges for us all. Not only must we continue to improve our safety record, but we must stand ready to accomplish each task we're assigned, no matter how difficult. Working together, we can meet any challenge in the year ahead.

Mrs. Ryan and I wish you and your families a most joyous holiday season and all the best for 1985. We look forward to working closely with you in the new year.

THOMAS M. RYAN, JR.
General, USAF
Commander in Chief

High Technology; has it spawned complacency?

by C.K. Manning

Judging by comments so far, the aviation world seems likely to accept that Korean Airline Flight 007 flew into Russian airspace because of a navigation error by the crew. The only feasible alternative—aerial espionage—does not merit serious consideration.

If it was a navigation error, it was a whopper, and it grew and grew for hours and hours. However, what still causes concern among air travelers is not so much how the error occurred and went unchecked for so long, but how resignedly the experts have accepted it as a probable cause of a major disaster.

Bad enough for the mistake to be made in the first place; worse for it not to be noticed for so long, tragic for it to result in 269 deaths, but bizarre for it to be acknowledged as likely in a Boeing 747 in 1983. The crew of Flight 007 was probably as good as any, so it isn't necessary to impugn them in any way to try to answer the question—how can this happen?

Because change comes fast in aviation, it isn't necessary to retrace history very far for background. Only a generation ago, military pilots started training knowing they had chosen a dangerous career. Military flying, which supplied airlines with most of their trained pilots in those days, lost between 20 and 25 percent of its pilots due to accidents. (Even in wartime, about a third of the losses were for reasons other than enemy action.) Examining one typical Navy class of 20

pilots, 5 were dead within five years of graduation; killed in accidents which included: spinning, hitting high ground in bad weather, arresting hook failure, inflight explosion, and night catapult launch.

Healthy Suspicion

Against this background, survival soon became an important theme for the young trainee. He thought and talked a lot about emergencies and learned to approach every flight, every aircraft, and everybody and everything connected with them as a potential cause of his sudden demise. A robust and healthy suspicion was the order of the day, reinforced by a good sprinkling of hairy experiences.

> "... the crew up front was watchful, suspicious, hardbitten. They were survivors."

Flying on the civil airways of the world, meanwhile, were the last of the big pistons, crewed very largely by ex-wartime fliers. Their aircraft represented the peak of the era, but were primitive by modern standards.

Every minute, in a typical 18-cylinder 2,500-horsepower doublebanked radial engine running at 2,400 revolutions per minute, more than a million high-speed reciprocations of moving parts took place, all needing constant lubrication. This, coupled with the reduction gearing, propeller, constant speed unit, super-charger, and ancillary drives, made the system extremely complex. The whole vibrating mass was acutely temperature sensitive. If you got through a 10-hour flight in a four-engine propliner without some sort of engine problem you were lucky. Airliners carried specialist flight engineers.

Back then, airliners flew below the tropopause, often penetrating bad weather. Navigation was by sextant, DF (direction finding) bearings, and dead reckoning. Crews included specialist flight navigators. Radio officers completed the crew. Long haul flying was particularly demanding of many skills, but you could buy a ticket and be pretty sure that the crew up front was watchful, suspicious, hard-bitten. They were survivors.

Now, pilots are increasingly a civilian product, coming to the airlines through various channels, but sharing the common background of safe, commercially-oriented, minimum-risk flying in docile aircraft, rarely frightened, and never attending funerals.

Now, on the flight deck, the job has changed almost out of recognition. No flight engineers; turbine engines have few moving parts, rotate at steady speeds, and seldom give trouble. No navigators; the inertial navigation system (INS) is wholly automatic and dead accurate. No radio officer. Just three pilots; sometimes only two.

Jets fly in the stratosphere where occasional turbulence is the only weather ever encountered. An autopilot coupled to an INS keeps the aircraft within a stone's throw of track hour after hour with minimal attention from the crew. Failures of any sort are rare and getting rarer.

Computers are taking over all aspects of flight management. There is little head work any more. Takeoff is still a manual maneuver in most airplanes, but the autopilot goes on soon after. The crew need only punch buttons for the next 10 hours to complete a perfect flight and automatic landing. It happens hundreds of times every day.

All this is common knowledge, of course, and generally accepted as a "good thing." It is certainly more efficient and safer than great thundering pistons, thrashing propellers and all that.

Unseen Danger

But there is a deadly, unseen danger creeping into modern flying. It is called complacency.

A few real-life examples, all recent, some fatal: an aircraft takes off with half the fuel in its tanks that the crew thought it had; an aircraft flies around, lost in clouds, below mountaintops, while the crewmembers consult their charts; an airliner takes off down a fog-bound runway without positive clearance; both pilots are locked out of a flight deck in flight, and have to smash the door down; and an airliner wanders off track for several hours in a highly sensitive area in an aircraft equipped with triple INS and radar. These examples indicate a trend away from the healthy caution of the "survivors" towards

reliance upon black boxes, the system, or somebody else.

Most of the world's airliners are being flown by competent and conscientious professionals. But the industry should recognize that the very excellence of modern aircraft, equipment, and traffic control is breeding a new generation of aircrews who feel safe in the air—too safe.

This is the paradox of dangerously safe, and unless we are ready to accept the pilotless, fully automatic, computerized, failsafe airliner (the technology is available in the space shuttle), we need to rethink the functions of pilots to prevent them from becoming airborne machine-minders whose fallibilities merely degrade the level of safety that could be achieved without them.

Computers couldn't make the sort of mistakes described above, which could more correctly be categorized as misdemeanors, or at any rate a different category from the usual "pilot error" involving error judgment, skill failure, or a genuine mistake.

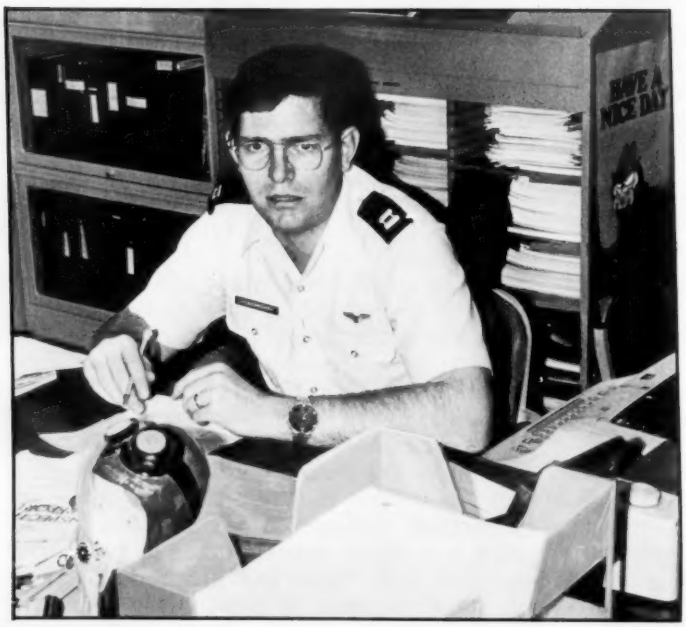
This new situation isn't the pilots' fault, but it is their problem. How *do* you harden pilots trained in a "hothouse"? How *do* you keep the concept of "airmanship" alive in a fail-safe, black-box environment? How *do* you stay awake and alert hour after hour on a soft seat in a warm room?

Professionals are paid to worry. Pilots should be disturbed at the way this part of their job is being usurped. They should be protesting the need to hold onto the realities of flying.

The complacency problem is analogous to another legendary killer of the air—carbon monoxide poisoning: invisible, odorless, creeping into the cockpit, and stealthily destroying the pilot's faculties. Very stringent design measures were needed to keep it out. Aircrews should be thinking now how to design out complacency. If we don't, and we therefore have more "dumb" accidents, it will soon become clear even to the lay passenger that something has gone seriously wrong.

Reprinted from *Air Line Pilot*

Global Notes



Completing the triennial rotation of associate editors, *TMF* picks up yet another errant airman with this issue. Capt. Donald L. Rosenberry comes to the staff from the far east; Yokota AB, Japan, to be exact, where he served for the past five years. Don graduated from the USAFA in 1978 with a degree in biology. He then proceeded to UNT at Mather AFB, followed by C-130 training at Little Rock AFB. Then it was off to his first "real" assignment, flying with the 345 TAS at Yokota. After three years of tactical airlift in the Pacific, and an upgrade to instructor, Don was reassigned to the 316 TAG, also at Yokota, as their Flight Safety Officer. We at *TMF* warmly welcome Don and his family to Scott AFB and the MAC Directorate of Safety.

One Night in December

I had become a literary vegetable; all I wanted to do was watch TV. Then I was surrounded by all the TV Christmas "specials." "The Perry Como Christmas Special" was to the right of me; "The Joan Baez Christmas Special" to the left of me. Then there were "The Muppets and John Denver!" Yecch! I'd finally had enough, so I yanked the plug on my Sony, and settled back in my "Stratuslounger" for some easy reading.

As I thumbed through a familiar flying safety magazine, I noticed an advertisement for a writing contest. Why not, I thought, enter this contest now instead of waiting until the deadline—31 March. I certainly had a good story to tell, and my TV wasn't going to taunt me with "The Debbi Boone Christmas Special," was it? I walked over to my Smythe-Colona, and began to type.

Slowly at first, the story began to take shape. As the minutes passed, the words came easier and faster. My fingers ached from the strain of typing, but I continued the process: Write, edit, rewrite, and edit some more. Finally, when the last period was in place, I slipped the manuscript into a large envelope and mailed it. The deed was done.

As the snows melted and the first rays of the spring sun warmed the country, the 31 March deadline also approached, but much faster than the warm weather. My friends hurried and rushed, while I leisurely studied for my annual qual-tac writtens.

Finally, a message arrived from a place called I-G-F-E. I hesitated; I couldn't look. But then I forced myself to glance at the list of winners. There on top was my name! I shouted for joy! The ops officer came out of his office, read the message, and patted me on the back. The squadron commander shook my hand, made me chief of stan-eval and sent my OER off base for the first time, ever! To make a long story short, I was promoted to major below the zone, and now I have a cushy job in the wing, all thanks to that story I wrote one dark December night.

Does all of that sound farfetched? Maybe, but the point our young, budding Dickens tried to make was that it's not too early to get started on your entry for the MAC Flying-Safety Writing Contest! Just for entering we award you a free one-year subscription to *The MAC Flyer* and a C.R. Terror designer T-shirt. So, unless you positively groove on Como or the Muppets, turn off the TV and get started today. Then, when 31 March rolls around, you can sit back and snicker at all those literary derelicts trying in vain to make the deadline!

The Rules

The 1985 MAC Flying Safety Writing Contest is conducted according to MACR 900-3 and these rules. All entries must be original, unpublished and postmarked no later than 31 March 1985. Stories must be between 1,000 and 3,000 words long (about 6 to 14 double-spaced typed pages); poetry should be about 75 to 100 lines. Entries must contain an *aviation safety/mishap prevention message*. Manuscripts must be double-space typed and submitted in two copies. Identify entries by title only and attach a cover sheet showing the author's name, address, duty phone number and unit. Also, the cover sheet should contain a brief autobiography.

The contest is open to anyone. Entries qualifying under the above rules earn their author a free C.R. Terror T-shirt (so indicate your size) and a free 1-year subscription to *The MAC Flyer*. However, contest prizes (desk sets and plaques) may only be awarded to military members and civilian employees of the Department of the Air Force or Air Reserve Forces. Other entrants may be selected for Honorable Mention in a Special Category. All winning stories will be published in *The MAC Flyer*. Entries should be addressed to:

Safety Writing Contest
HQ MAC/IGFE
Scott AFB, IL 62225

There's Them That Have and

Channelized attention may be hazardous to your health.

by 1st Lt. Ray Duncan
71 FTW
Vance AFB, Oklahoma

I felt relaxed as I strapped into the T-38 for the return leg of an "out and back" which was to be my student's last sortie in UPT. He was an excellent student, a hard worker, and he consistently displayed a level of judgment well above that of a pilot with a similar background. I was pleased with his performance on the first leg, and I casually performed the required checks as we taxied out to the runway. Once airborne, I sat back in the seat and reflected on the report which had come across my desk earlier that day.

As a physiological training officer, I've become increasingly involved in educating crewmembers about the problems associated with human factors. The report that I'd read was almost a textbook example of what can happen to a crew on a routine mission.

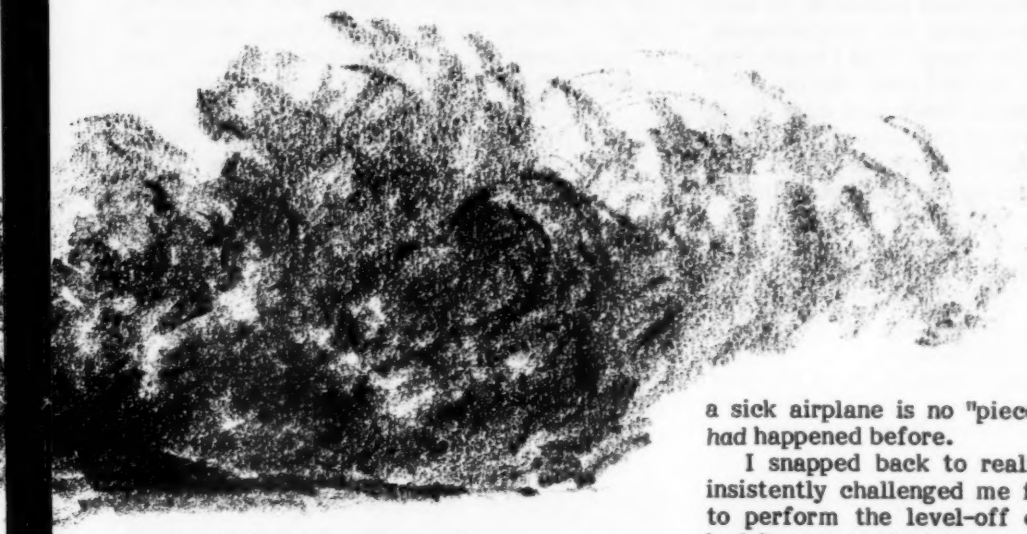
The aircraft involved was a C-130, and the crew was finishing a segment of a low altitude training route. As far as anyone could tell, the sortie had progressed normally until the mishap. Weather was a factor, but not insurmountable—an overcast deck at 3,000 feet AGL with 5 miles visibility. The aircraft commander was competent and had recently checked out in low altitude airdrops. He had a reputation as a solid, professional pilot, and the Safety Investigation Board hadn't uncovered evidence of any deficiencies in training, supervision, or crew qualification. The copilot was experienced in the C-130 and ready to upgrade to the left seat.

The report stated the crew had become distracted by an overheating number-4 engine, which had developed into a fire. In order to better cope with the emergency, the AC chose to climb. The board further surmised that the crew's attention had become channelized on the emergency situation, and this led to a state of disorientation while penetrating the weather.

I thought about the lesson plan we use to instruct human factors and attempted to put the pieces of the puzzle together using the

Honorable Mention 1984 MAC Flying Safety Writing Contest

Them That Will



results published by the board.

Channelized attention is widely recognized as a very dangerous and commonly occurring defect or anomaly of attention. It manifests itself when a crew focuses its attention on a limited number of environmental cues while excluding those of a more immediate priority. Aircrew fatigue, lack of knowledge, excess motivation to succeed, or any contingency situation can work alone or in combination to cause the pilot to ignore the "obvious." Also, distraction is frequently involved in the mishap scenario. It's generally of an urgent nature, such as the sounding of an aural warning, the flash of a warning light, or even an unexpected noise or radio call. Distraction can also be of a chronic nature, most frequently a family or a personal problem. In any case, it can cause a pilot to allow his attention to be monopolized (channelized) at an inappropriate time. A threatening environment (prebriefed or unexpected), disinterest, psychological problems, and inexperience can all lead to distraction.

I began to doubt the validity of the board's conclusions. After all, wasn't the crew as qualified for the mission as necessary? They were certainly motivated, and were not suffering from any personal problems. Sure there had been a threat—a low altitude sortie beneath the weather with a sick airplane is no "piece of cake," but it *had* happened before.

I snapped back to reality as my student insistently challenged me for the third time to perform the level-off check. He said I hadn't answered right away, and asked if I was okay. I assured him I was fine, finished the check and assumed control so that I could clear my head. I kept the student occupied with some VFR map-reading as we discussed his new assignment. He had gotten his first choice, a C-141 to Norton AFB.

I must just be tired, I thought, as I explored the airspace from one side of our assigned altitude to the other, and rewrote the *Pilot-to-Controller Glossary* on nearly every radio call. Frustrated and more than just a little perturbed, I gave the jet back to my student and slipped quietly back into the Twilight Zone.

I'd received a telephone call about a month before from a former student. It was not a social call, but one which brought sad news. A C-130 had crashed during a low-level sortie and the AC had been a classmate of his. That AC was also one of my students. At the time, I couldn't believe it! Jack had been an average student, not great, but certainly a capable pilot. He never had any significant problems in UPT. Scott had said the details were sketchy, but that it appeared the pilot had flown the aircraft into the ground due to disorientation. All on board were killed instantly.

Now I could see it—it was all in black and white, the image of the printed page remained in my mind. The crew had

thoroughly briefed all aspects of the mission. They were indeed a well-prepared and coordinated team. So what had happened? I questioned everything I had passed on to Jack and how I had evaluated his performance. Was I too harsh? Too easy? Did I teach him everything I could? Or had Jack and his crew run up against one of those bad days when Murphy takes control of the aircraft?

The printed words returned again and again—"The crew exceeded their abilities by channelizing their attention on an engine malfunction...became disoriented...flew the aircraft into a position from which recovery was not possible...ground impact occurred with approximately 50 degrees left bank, 25 degrees nose low at 320KIAS..."

How many times, I thought, have we seen this one? Malfunctioning gear indicators, armament switch failures, frozen pitot tubes, fire lights, incorrect EPR; a seemingly endless litany of insignificant and annoying problems that have led to loss of aircraft control in an otherwise flyable airplane. Don't we preach "maintain aircraft control" enough?

Why can't we teach judgment? An experienced pilot can mentally discard those tasks which are not important or delay the performance of those tasks until a more opportune moment, *most* of the time. It would be nice if we could package all that experience—all the "war stories," and all the "bar-talk"—and hand a copy to every pilot who flies our aircraft.

We entered the radar pattern at homeplate and the student flew a couple of ILS approaches. Then, on the third approach, it happened! I saw a large flock of birds at our 12 o'clock and tried to jink around them. Too late on the jink, I ducked down below the glareshield as the birds impacted. They struck the left wing, but fortunately no other damage was done. I checked the engine indications and coordinated with approach control for a full stop landing. We then checked the wing for damage. It wasn't until the student yelled something that sounded a lot like "recover", that I realized we were in a nose-low attitude, with only a thousand feet of air between us and the ground. I flew the aircraft back on the proper final approach course, and configured for the approach. Suddenly, I realized what had happened to Jack.

We landed uneventfully and walked back to the squadron. Later, I congratulated Ken on the sortie as well as on completing UPT. He seemed unusually quiet as I graded the flight. While we were debriefing, neither of us mentioned the mistakes that I'd made, and I certainly wasn't going to advertise them.

As we finished, he asked if I had any advice for him. I told him that he should study hard, work at becoming a good pilot and crewmember, know his abilities and his limitations, be aware of the quality of his crew and, most importantly, to admit mistakes while striving to be a professional aviator.

He asked if that was all. I felt a twinge of guilt as I reflected on what I'd just said or maybe hadn't said. "No," I replied "There's one more thing, and I just learned about it myself."

1st Lt. Ray Duncan graduated from the University of Minnesota in 1978. Commissioned through OTS in 1980, he finished UPT at Vance AFB, Oklahoma, in 1981. He remained at Vance as a T-38 IP and is presently the rated PTO in the 71 FTW Physiological Training Unit.

Flying-Hour Milestones

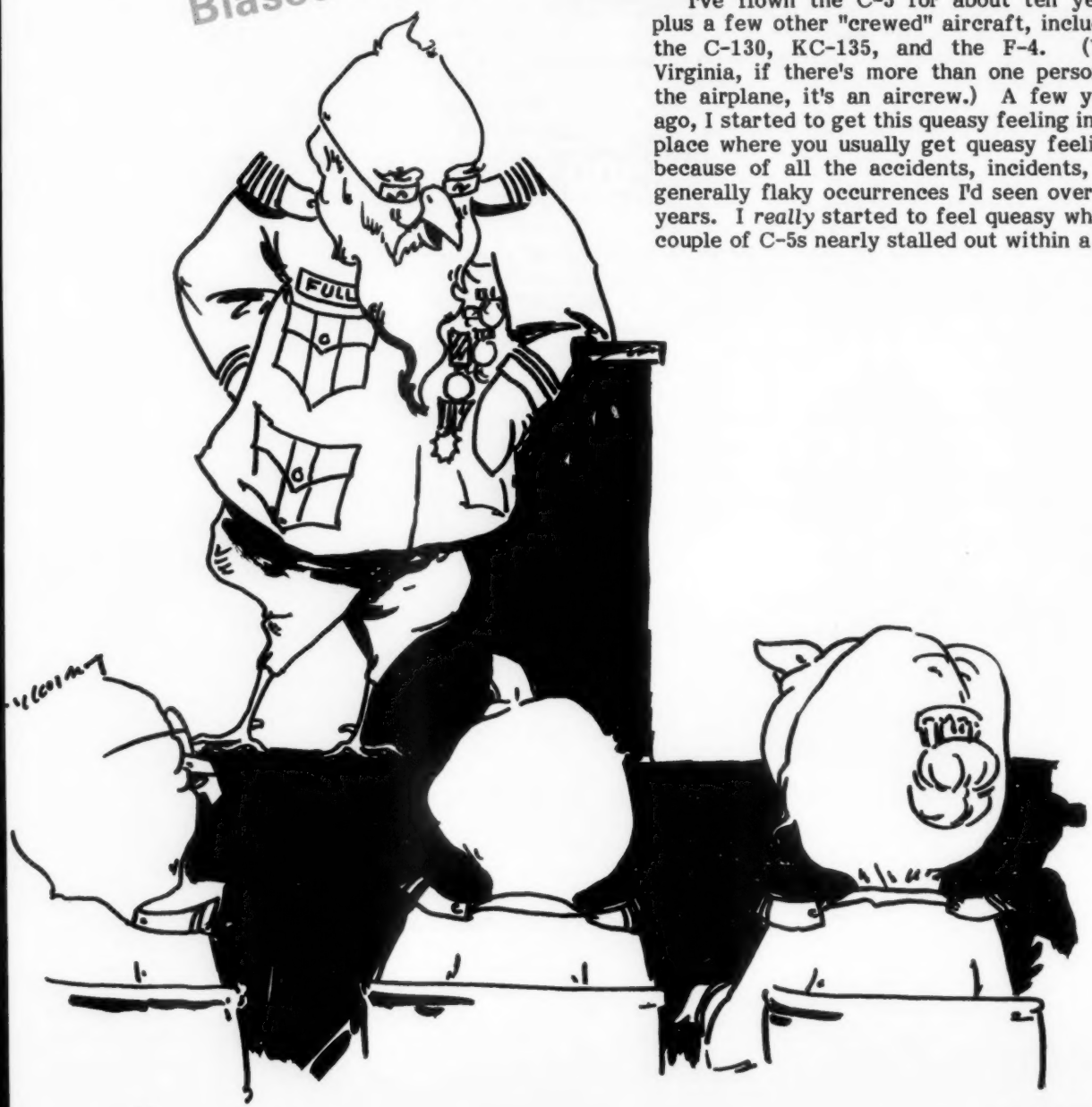
MSgt Donald E. Schaefer, Jr., 774 TAS

Lt Col Peter H. Newton, 1401 MAS
Lt Col Floyd T. Weighing, 20 MAS
Maj Donald C. Blair, Jr., 1400 MAS
Maj Lebo S. Centanni, Jr., 301 ARRS
Maj James M. Cobern, 166 TAG
Maj Harry R. Lewis, 22 MAS
Maj Ronald G. Mehan, 166 TAG
Maj Jimmie L. Williams, 185 TAS
SMSgt Danny M. Platt, 185 TAS
SMSgt Larry L. Platt, 185 TAS
MSgt Sam Loring, Jr., 301 ARRS
MSgt Charles M. Perry, 166 TAG

Capt Blanchet, 22 MAS
Capt Steven R. Yestness, HQ MAC/DOTF

Ranks and units are those at time of award. See MACR 900-3 for details on how to apply for your own milestone award.

My Own Biased Opinion



Hello, out there! This is my day to offer my latest biased opinions on lots of topics. It's for you, the crewmembers I've flown with, or may fly with one day.

I've flown the C-5 for about ten years, plus a few other "crewed" aircraft, including the C-130, KC-135, and the F-4. (Yes, Virginia, if there's more than one person in the airplane, it's an aircrew.) A few years ago, I started to get this queasy feeling in the place where you usually get queasy feelings, because of all the accidents, incidents, and generally flaky occurrences I'd seen over the years. I *really* started to feel queasy when a couple of C-5s nearly stalled out within a few

by Lt. Col. Conrad Biegalski
312 MAS/DOV
Travis AFB, California

weeks of each other. That feeling intensified when a commercial DC-8 didn't make the macadam thanks to a small oversight, e.g., they—the aircrew—ran it out of fuel. That queasiness only got worse when a Boeing 737 hit a bridge right after takeoff. I kept thinking that with all those highly-trained people on board, how come *somebody* didn't see what was happening and *say something*. What happened to crew coordination?

Then I started thinking about all the buzzwords that were running through my mind as I mentally characterized the crewmembers. You know, words like "crew coordination" and "situational awareness." Those are really great terms we all love to toss around, usually in conjunction with other words like "aircrew discipline" or "airmanship." Now, all these words connote a lofty sense of purpose and sound really "professional," but what do they mean?

Maybe if the editors of this fishwrapper and I do this properly, this little discussion might enhance our collective odds of keeping the shiny side up and the rubber side down. In a word, plain old flying safety and the preservation of one's tail feathers!

Crew Coordination

A lot of people I've known use this term to describe checklist responses, directing the flight engineer to coordinate some emergency procedure, or briefing the boss on hazardous materials. That's probably what you've heard for years, and there was never a reason to think otherwise. Wrong! Crew coordination actually consists of at least four essential elements and breaks down disastrously when any one of these elements turns up missing.

● Overlapping Areas of Responsibility—This one also falls under the heading of "being your brother's (or sister's) keeper." There's no reason a flight engineer can't remind a pilot of an omitted checklist or checklist step, or even divert a momentarily free eyeball toward the altimeter or green lights above the gear handle. There's also no reason for the pilot to completely ignore the engineer's panel. In fact, when we overlap our areas of responsibility, we're doing each other a big favor. Face it, we're all human and we all make mistakes, but we're all on the same air machine, and if something bad happens to one, it will eventually happen to all.

● Communicating Clearly—When the pilot is busier than the proverbial one-armed paperhanger, and his mind is cluttered with a dozen different problems, there is the tendency to ignore the engineer's or loadmaster's first try to inform him of one more problem. But if it's important, keep after it. If I'm about to screw something up, or if a problem has surfaced that really needs my attention, I want to hear about it. More importantly, I want the crew to keep after me until I both hear *and* understand the importance of what they're telling me. Don't assume pilots don't want to listen. Don't assuage your conscience by saying, "I told him so!" I'd like to think that there are a whole bunch of guys running around the command mentally chastising themselves for not being assertive on that one incident where they could have saved the day. But these incidents and mishaps keep happening. Maybe the learning process isn't really taking place like we think it is. The scariest thing is that there are more than a few crewmembers thinking, "Well, I told him once, he didn't listen, and he got what he deserved." Tell you what, ladies and gents, if those people are out there (and they are), they don't even demonstrate the common sense required to keep themselves alive. Do you want to fly with people like that?

● Group Problem Solving—Getting from point A to point B safely, keeping takeoffs and landings in a ratio of one-to-one, and landing on rubber instead of sheet metal consistently, is nothing but a problem to be solved by a group known as an aircrew. I'm pretty sure many of our aircrews aren't reacting and interacting the way they should. Led by an aircraft commander, the aircrew should produce a synergistic effect necessary for real group problem solving. By the way,

synergy, loosely translated, means "cooperative action of separate parts such that the total effect is greater than the sum of its parts." Now, that's just what an aircrew should be. If we interact properly, we become not just a random collection of specialists, but a group who can assist each other in putting the pieces of the puzzle together properly, time after time. Trouble is, though, that the concept of synergy leads us right back to the first two problems. We don't create synergy if crewmembers concern themselves with their own specialties, or if the communications are ineffective.

● Leadership—All of these concepts can't take place unless we have a recognized leader who sets the proper climate for effective group operation. That's the aircraft commander—AC for short.

Professionalism

My friend Webster says this equates to "extreme competence in an occupation or pursuit, sometimes marked by originality." The first part of this definition sounds real spiffy, but the second part is a very damning criticism which all too often fits us to a tee, like a leotard on C.R. Terror. Perhaps what we really need to develop is a "professional" crewmember who

—Knows everything the regs say he or she needs to know;

—Understands that although the "books" are a giant morass, they represent only a percentage of the total knowledge necessary to fly safely from day to day;

—Continually strives to augment professional knowledge; and

—Is fully aware of his or her ability to make a mistake about almost anything, at almost anytime; and who, therefore,

—Makes *maximum* use of his or her creativity and crewmembers to solve problems as a group.

Situational Awareness

This is the latest buzzword. *(Editors' Note-* "Buzzwords" only deserve that name if we use them to try to impress someone without actually understanding their true meaning and applying them to our work.) Unfortunately, buzzwords get misused and overused by people who shotgun them at problems to avoid solving the problems. Situational awareness, SA for short, can mean many things and depends on the circumstances. To a pilot, it could mean a self analysis of the destination weather report, and recognizing the potential for black ice on the runway. To a loadmaster, it may mean noticing that a tiedown looks a bit light and arranging for time to check it out later. To the engineer, it could mean recognizing, from radio traffic, that the crew is turning base leg. That, in turn, means it's time to concentrate on backing up the pilots on the checklist, wheels, and other critical stuff.

Airmanship

I lied, people. I started out this treatise by claiming I'd go from the simple to the complex. But airmanship is simply the composite of everything it takes—written and unwritten—to get the airmachine, its crew, passengers, and cargo from A to B, safely, time after time.

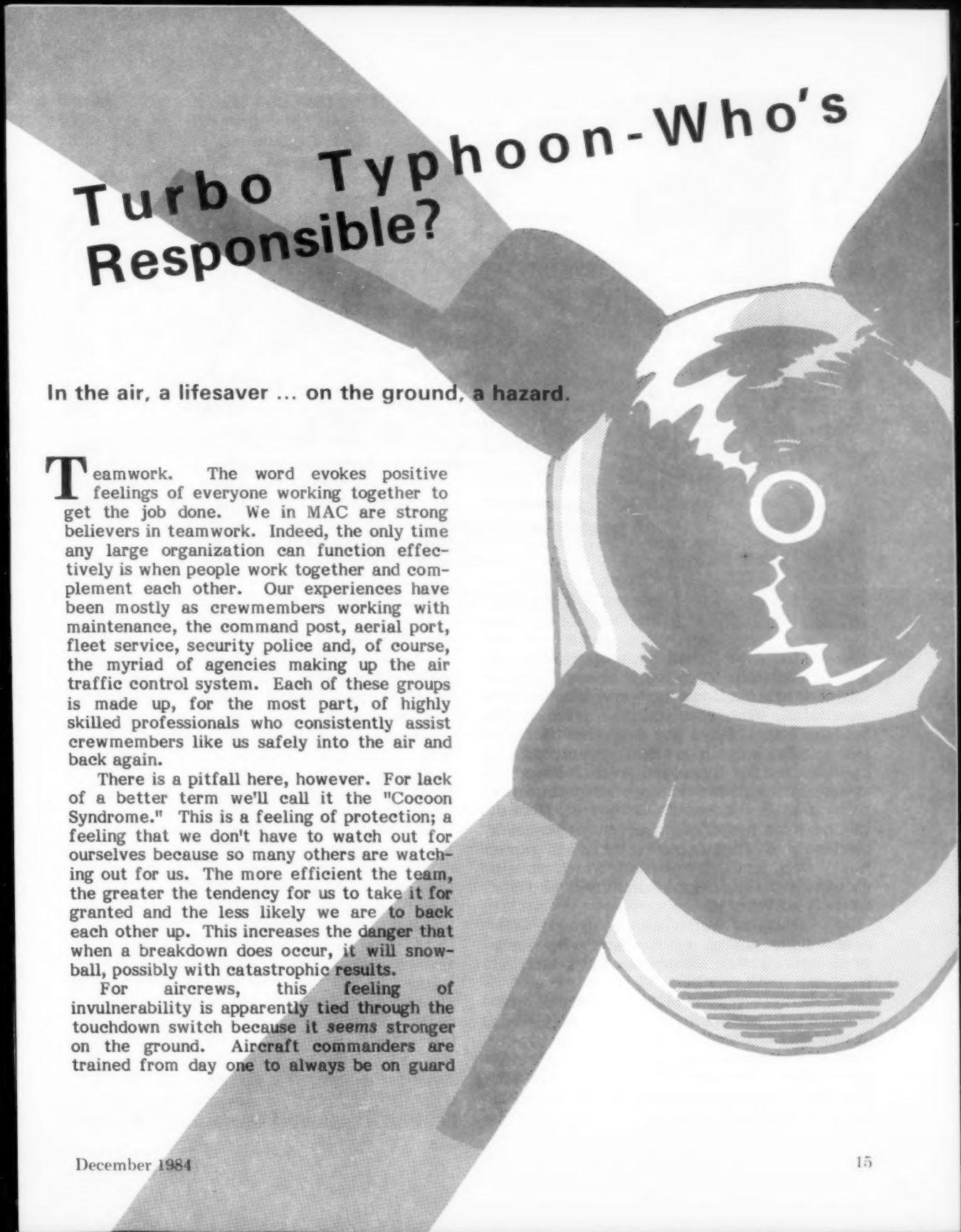
Conclusion

I'd really like to quit here, but I still have that queasy feeling in my stomach. You see, after talking to several crewmembers about all of this stuff you've just read, I found out nobody—not one person—had ever received any formal training in crew coordination! For that matter, they (about a hundred, all tolled) also never received any formal training in any of those other concepts I've mentioned! Maybe it's so simple that "anybody ought to know that." But, funny thing, mishaps keep right on happening. So, unless you receive a neat little correspondence course in the mail next week on crew coordination, maybe we should start to measure ourselves with brutal honesty to see if our individual and collective performance to date really demonstrates all those qualities I mentioned before. Then, maybe we could start a dialogue among all the squadron commanders, ACs, instructors, and crewmembers, sort of like an informal training program.

Well, I've gotta go fly tonight, so I'll see you around the pattern. Remember, keep the shiny side up...etc.

*(Editors' Note-*As of this writing, two active duty MAC crewmembers have received United Airlines' Cockpit Resource Management Training. HQ MAC/DOT has also started to restructure some of its simulator training to reflect an emphasis on the items Colonel Biegalski discussed here.)

Turbo Typhoon-Who's Responsible?



In the air, a lifesaver ... on the ground, a hazard.

Teamwork. The word evokes positive feelings of everyone working together to get the job done. We in MAC are strong believers in teamwork. Indeed, the only time any large organization can function effectively is when people work together and complement each other. Our experiences have been mostly as crewmembers working with maintenance, the command post, aerial port, fleet service, security police and, of course, the myriad of agencies making up the air traffic control system. Each of these groups is made up, for the most part, of highly skilled professionals who consistently assist crewmembers like us safely into the air and back again.

There is a pitfall here, however. For lack of a better term we'll call it the "Cocoon Syndrome." This is a feeling of protection; a feeling that we don't have to watch out for ourselves because so many others are watching out for us. The more efficient the team, the greater the tendency for us to take it for granted and the less likely we are to back each other up. This increases the danger that when a breakdown does occur, it will snowball, possibly with catastrophic results.

For aircrews, this feeling of invulnerability is apparently tied through the touchdown switch because it *seems* stronger on the ground. Aircraft commanders are trained from day one to always be on guard

against the overworked or inexperienced air traffic controller who might, at any moment, direct an unintentional turn into the side of a mountain. But once on the ground, it's "cocoon" city. Have you ever flown a flawless mission only to get lost enroute to the parking spot? Have you ever followed a marshaller's signals into a spot that you *knew* to be a little too small? Of course, none of this has *ever* happened to us but we've heard stories.... A flight, like a baseball game, "ain't over until it's over," which means chocks in place, engines shutdown and the aircraft buttoned up.

A review of some recent ground incidents—some costly, all embarrassing—leads us to believe that sometimes we're just *too* trusting.

Recently, maintenance personnel requested a C-141 crew perform an engine run in order to troubleshoot a bleed air problem. When the maintenance technician requested max power, the crew complied. After all, this was a *maintenance* engine run with the approval of *ground control*.

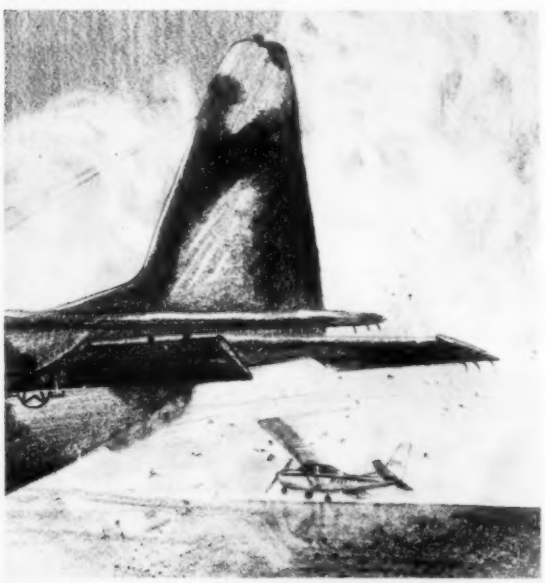
The maintenance technician wanted as much pressure as possible in the bleed air manifold to ensure a thorough checkout of the problem, but was unfamiliar with C-141 engine run procedures. During the run, jetblast blew rocks, sand and tree limbs into several privately owned vehicles resulting in broken windshields and a damaged car body. Everyone *assumed*, incorrectly, someone else was in charge and a max-power run at that location was safe. It wasn't.

The hazards of assuming are not always between the aircrew and other agencies but may be between different crew positions onboard the aircraft. For example, take a C-141 attempting to block out on a local training sortie with a first-pilot upgrade trainee in the left seat and a qualified instructor in the right. When the trainee had to use sustained power for block-out, the instructor suspected a parking brake problem and had the trainee retard the power to idle. As it turned out, the parking brake had not been fully released by the trainee who was inexperienced in the left seat. The damage,

however, had already been done. The jet-blast, coupled with gusty wind conditions, had propelled a crate containing a main landing gear door into the number-four engine nacelle of another C-141. The crate had been positioned in front of the ill-fated Starlifter in preparation for installation.

The dangers prop or jet blast pose to light aircraft cannot be overemphasized. MAC crews operate daily into civilian airports as well as bases which sponsor aeroclubs. We share the same airspace, runways, taxiways and ramp space as these lighter, more vulnerable aircraft. Two recent incidents have reemphasized the need for increased vigilance while operating at these locations.

A C-130 blocking in at an overseas base followed a marshaller-directed, sharp, 90° left turn which placed the Herk's tail toward a single-engine Cessna. As the turn progressed, prop blast lifted the Cessna's left wing causing the opposite wing and spinner to contact the ramp. The impact bent the right wing upward approximately 18 to 24 inches inboard of the wing tip and caused slight damage to the fiberglass spinner. After the momentary right bank, the Cessna returned to the upright position. Prior to the turn, the C-130 crew saw the Cessna and one of the crewmembers even advised the aircraft commander that the Herk's prop blast might blow the light aircraft over. It did.



The Cessna pilot, a student on his first solo cross-country, had left the aircraft unchocked and unmoored *assuming* the Cessna would remain in place. The aircraft commander *assumed* the Cessna was far enough away to prevent damage and that the marshaller would not direct an unsafe turn. *Both* were wrong.

Occasionally, we become so familiar with a certain phase of operation that we assume everyone else is as well. A C-130 engine run-up is a standard procedure prior to the aircraft's first flight of the day and, recently, a Herk crew at a non-MAC base was asked to perform a maintenance engine run to check out a propeller malfunction. The AC was careful to choose a taxiway that wouldn't cause prop-blast damage to taxiing aircraft and, with tower's concurrence, chose what seemed to be a suitable location. He then turned the Herk into the wind IAW the Dash-One which placed the tail of the aircraft toward the active runway. During the engine run, tower cleared a light aircraft to land behind the C-130. As the smaller aircraft touched down and passed behind the Herk, the pilot lost control of the light aircraft, which skidded sideways, collapsing the nose gear and damaging the main gear, propeller and engine. The crew *assumed*, in this case, that the tower controller understood the potential damage a large aircraft running engines could cause to a smaller one. The tower controller, on the other hand, *assumed* the aircrew was familiar with a local regulation governing engine runs which prohibited jet/prop blast across the active runway. And, the light aircraft pilot undoubtedly *assumed* the tower controller wouldn't clear him to land if the Herk's prop-blast posed any potential danger. Wrong again!

So, what's the point here? *Never* perform another maintenance engine run and *never* follow another marshaller's signal? *No!* Remember our discussion on the importance of teamwork? Although we're *all* professionals, we *all* make mistakes from time to time. As we interact with one another in getting the mission accomplished, let's keep our collective heads out of the sand and back each other up. Murphy is alive and well and we don't need to help him out by shrouding ourselves in an imaginary "cocoon" of invincibility.

TMF Takes a Checkride

Results of the 1984 Readership Survey.

Every other year, we at *The MAC Flyer* "test the water" to see how well our readers feel we're doing our job. We sent out a pallet-load of surveys (1,700 to be exact) to a representative sample of MAC overseas and stateside units. The results of the survey revealed several areas needing improvement, which we hope will help us to be more responsive to you. Overall, the results indicate we're attaining our goal of promoting flight safety throughout the command. Can we improve? Of course. Will we work to improve? You can bet your flight pay on it!

The survey explored several items of interest to us. Among them were circulation (are we reaching you with our product?); quality (do you consider the magazine to be attractive, readable and most of all, educational?); popularity (which articles do you enjoy reading most and least?) and reader comments (how can we better serve your needs?).

Circulation

We found that we're well-read and accessible with 50 percent of those surveyed indicating they read at least six issues each year and 20 percent indicating they read every issue. Fifty-seven percent are reading at least one-half of each issue. Over 54 percent of you read the magazine during the first month it's released. The work center is where 64 percent of our readers obtain *TMF* but, surprisingly, 18 percent indicated the magazine was obtained through "other means" (stolen, etc.). Really? Ladies and gents, if you need more copies just contact HQ MAC/IGFE and we'll attempt to fix you right up. We've determined we're reaching most of you, but are you getting a quality product?

Quality

We earned high marks in appearance and readability. Thirty-seven percent of the respondents rated our appearance as either "pleasing" or "bee-u-tiful" and a whopping 76 percent rated our readability as either "super" or "interesting."

Our primary objective at *The MAC Flyer* is to promote flight safety through education. Eighty percent of those surveyed indicated we were increasing safety awareness to some degree and 11 percent felt we had increased safety awareness a "great deal." Since it appears our message is getting through to you, which articles do you prefer to carry the message?

Most Read—Least Read

The most popular article in *TMF* was "Mishap With a Moral." Slightly more than one out of every four, 26 percent, would like to see more of these articles. The second-place article voted most likely to be read was "Quick Stoppers." Twenty-four percent of our readers would like to see more of these short and to-the-point educational articles. Third place was a tie between "Excellence in Airmanship" and *TMF* "Cartoon/Touch 'N' Go" (back cover) with 20 percent of the respondents wanting to see more.

P.S.—C.R. Terror finished a close fourth with 19 percent wanting to read more about the Rhinestone Flyboy. Thirteen percent of those surveyed would like to see less of the Winged Warrior and the balance, 68 percent, felt their dosage of C.R. was about right. *Conclusion:* C.R. is a lot like buttermilk. Either you love it or you hate it. Whether you love him or hate him, we hope you learn from his mistakes.

Among the less popular articles, "Flight Lines" (letters to the editor) and the "Writing Contest Winning Articles" tied for first place. Twelve percent would like to see fewer of these. Second place went to "Flyer Forum" (reader opinions) with nine percent of the readers desiring less. *Editor's Note:* We realize our guest writers don't have the luxury of several skilled editors reviewing their work before it's submitted. However, this is *your* magazine, so keep those articles coming and we'll keep printing them.

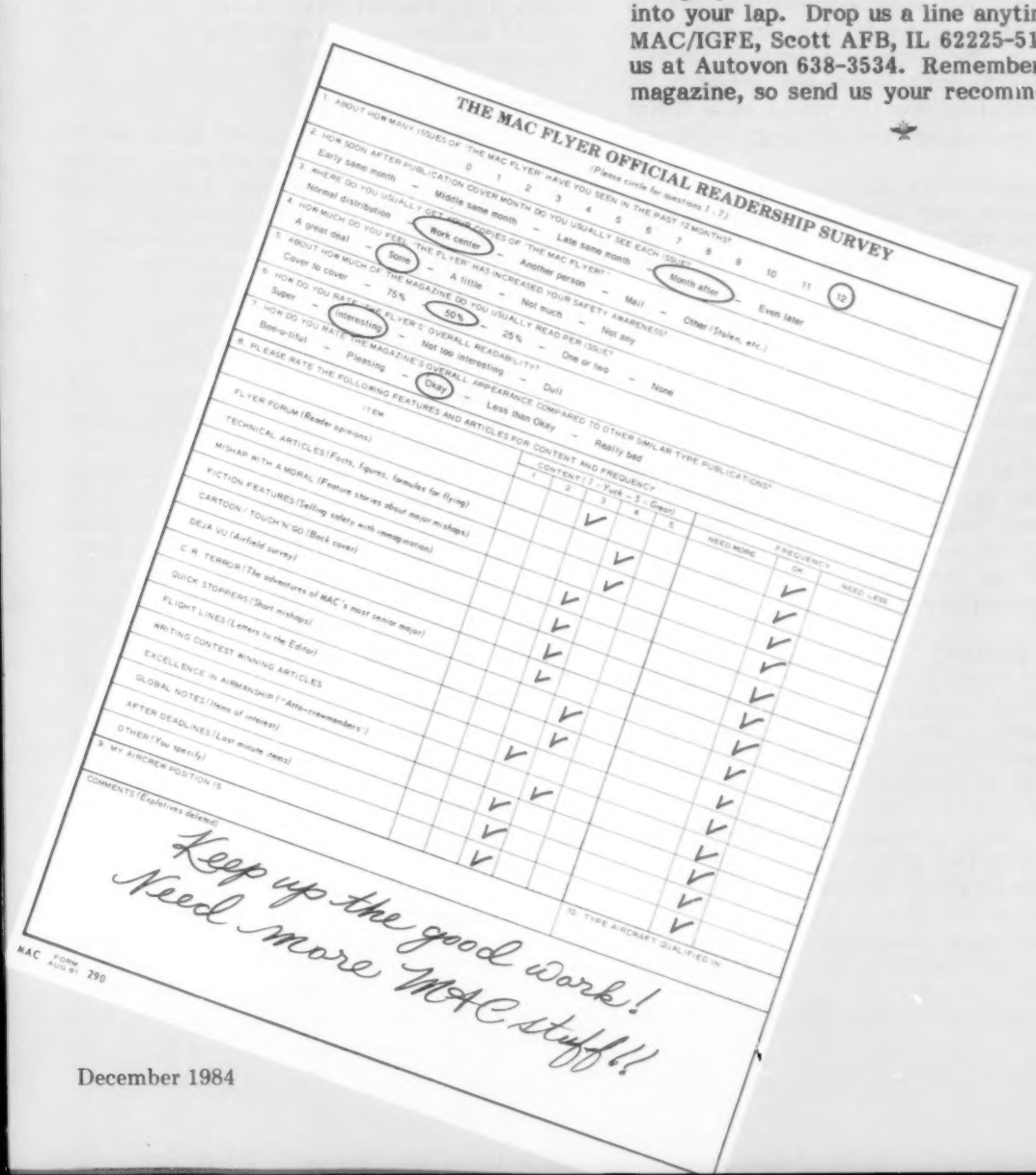
Holding down third place for "least likely

to..." were our "Technical Articles" (facts, figures, formulas for flying). We've determined which articles you prefer to carry the message; next we'll look at any additional comments you made to improve the magazine.

Comments

The additional comments again reminded us of buttermilk and for the most part, were very positive. "*MAC Flyer* is best in command" and "Excellent magazine," were typical comments in the positive vein. Comments relating to areas needing improvement included, "Need more articles on C-5," "more on helicopters," "more on AC-130," "Need more C.R." and "C.R. should be more accurate and less insulting." Thanks very much for the kudos and to those of you with negative comments, we appreciate your candor. You may be assured that each suggestion is given careful consideration.

In summary, the survey has helped us see ourselves as you see us. Your inputs have been considered, and will be used to help us better meet your safety education needs. If you have additional comments, don't feel as though you have to wait for a survey to fall into your lap. Drop us a line anytime at: HQ MAC/IGFE, Scott AFB, IL 62225-5101 or call us at Autovon 638-3534. Remember, it's *your* magazine, so send us your recommendations.



How to Avoid a Midair Collision

Interesting techniques for developing outside scanning patterns.

Studies of the midair collision problem reveal certain definite warning patterns. For instance, nearly all midair collisions occur during daylight hours and in VMC conditions! The majority happen within five miles of an airport, in areas of greatest traffic concentration, and usually on warm weekend afternoons when more pilots are doing more flying. Also surprising is that the closure rate is relatively slow, usually much slower than the airspeed of either aircraft involved. That's because the majority of inflight collisions are the result of a faster aircraft overtaking and hitting a slower plane.

Statistics on 105 inflight collisions (1964 to 1968) show that 82% were at overtaking convergence angles; 35% were from 0°-10°—almost straight from behind. Only 5% were from a head-on angle.

These numbers, plus the fact that 77% occurred at or below 3,000 feet—49% at or below 500 feet—imply accurately that inflight collisions generally occur in the traffic pattern and primarily on final approach. Collisions occuring enroute generally are at or below 8,000 feet and within 25 miles of an airport. The pilots involved in such mishaps ranged in experience from first solo to 15,000 hours, and their reasons for flying that day were equally varied. But *no* pilot is invulnerable.

Causes of Midairs

Undoubtedly, more traffic and higher closing speeds increase the midair potential. For instance, a jet and a light twin have a closing speed of about 750 mph. It takes a minimum of 10 seconds, says the FAA, for a pilot to spot traffic, identify it, realize it's a collision threat, react, and have his aircraft respond. But two planes converging at 750 mph will be less than 10 seconds apart when the pilots are first able to detect each other! These problems are heightened by limitations with our air traffic control and radar facilities.

These are all causal factors, but the reason most often noted in the statistics reads, "Failure of pilots to see other aircraft"—failure of the see-and-avoid system. In most cases, at least one of the pilots involved could have seen the other in time to avoid contact if he had just been using his eyes properly. So it's really the misuse of that complex, vulnerable little organ—the human eye—which leads to inflight collisions. Take a look at how its limitations affect your flight.

Limitations of Eye

The eye is vulnerable to just about everything: smoke, dust, fatigue, emotion, germs, fallen eyelashes, age, optical illusions, and the alcoholic residue of last night's party. In flight, our vision is altered by atmospheric conditions, windshield distortions, too much oxygen, too *little* oxygen, acceleration, glare, heat, lightning, aircraft design and so forth. Most of all, the eye is vulnerable to the vagaries of the mind. We can "see" and identify only what the mind lets us see. For example, a daydreaming pilot staring out into space sees no approaching traffic.

One function of the eye that is a source of constant problems to the pilot (though he is probably never aware of it) is the time required for accommodation. Our eyes automatically accommodate for (or refocus on) near and far objects. But the change from something close, like a dark panel two feet away, to a well-lighted landmark or aircraft target a mile or so away, takes one or two seconds for eye accommodation. That can be a long time when you consider you need 10 seconds to avoid a midair collision.

Another focusing problem usually occurs at very high altitudes, but it can also happen at lower levels on vague, colorless days above a haze or cloud layer when no distinct horizon is visible. If there is little or nothing to focus on at infinity, we don't focus at all. We experience something known as "empty-field myopia." We stare, but see nothing, even if it should enter our visual field.

The NTSB has studied the effects of bin-

ocular vision during investigations of inflight collisions, with the conclusion that this, too, is a causal factor. To actually accept what we see, we need to receive cues from both eyes. If an object is visible to one eye, but hidden from the other by a windshield post or other obstruction, the total image is blurred and not always acceptable to the mind.

Another inherent eye problem is the narrow field of vision. Although our eyes accept light rays from an arc of nearly 200°, they are limited to a relatively narrow area (approximately 10°-15°) in which they can actually focus on and classify an object. Though we can perceive movement in the periphery, we can't identify what is happening out there, and we tend not to believe what we see out of the corner of our eyes. This often leads to "tunnel vision."

This limitation is compounded by the fact that at a distance, an aircraft on a collision course with you will appear to be motionless. It will remain in a seemingly stationary position, without appearing to either move or grow in size for a relatively long time, and then suddenly bloom into a huge mass filling one of your windows.

In addition to the built-in problems, the eye is also severely limited by environment. Optical properties of the atmosphere alter the appearance of traffic, particularly on hazy days. "Limited visibility" actually means "limited vision." You may be legally VFR when you have three miles, but at that distance on a hazy day, opposing traffic isn't easy to detect. At a range closer than three miles, even though detectable, it may be unavoidable.

Lighting also affects our vision. Glare is usually worse on a sunny day over a cloud deck, or during flight directly into the sun, making objects hard to see and scanning uncomfortable. Also, an object that is well lighted will have a high degree of contrast and will be easy to detect while one with low contrast at the same distance may be impossible to see. For instance, when the sun is behind you, an opposing aircraft will stand out clearly, but when you're looking into the sun and your traffic is "backlighted," it's a different story.

Another contrast problem area is trying to find an airplane over a cluttered background. If it's between you and terrain that is multicolored or heavily dotted with buildings, it will blend into the background until it's quite close.

Then there is the mind. How often have you filed IFR on a CAVU day, settled back at your assigned altitude with the autopilot on, and then never looked outside, feeling secure that the ATC radar will protect you from all human harm? Don't you believe it! The ATC radar system has limitations. It's fine to depend on instruments, but not to the exclusion of the see-and-avoid system.

As you can see, visual perception is

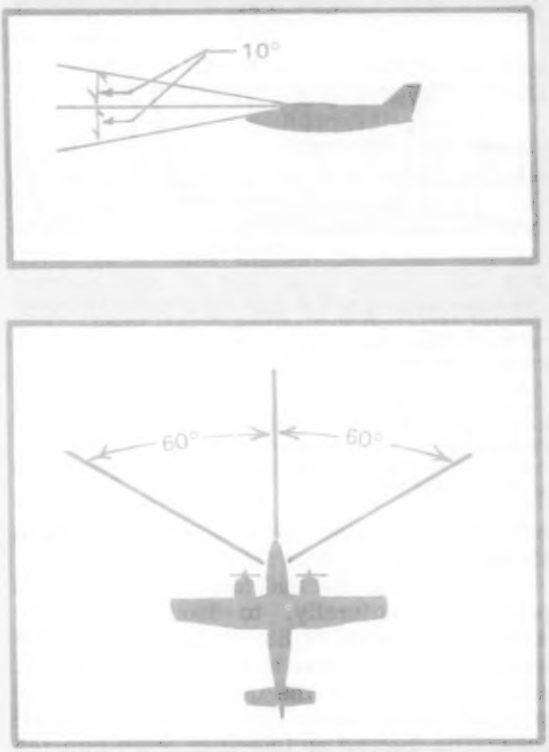


Figure 1. You can generally avoid the threat of an inflight collision by horizontally scanning 60 degrees to the left and right and vertically scanning 10 degrees up and down.

affected by many factors, but the best way to avoid other aircraft is to learn how to use the eyes in an efficient scan pattern. The most important thing is for each pilot to develop a scan that's both comfortable and workable in a particular aircraft.

How to Scan

There is no one perfect way to scan, or at least there is no one scan that is best for all pilots. The best way to start is by getting rid

of the bad habits. Naturally, not looking out at all is the poorest scan technique, but glancing out at intervals of five minutes or so is also poor when you remember that it only takes seconds for a disaster to happen.

Glancing out and giving it the old once-around without stopping to focus on anything is practically useless; so is staring out into

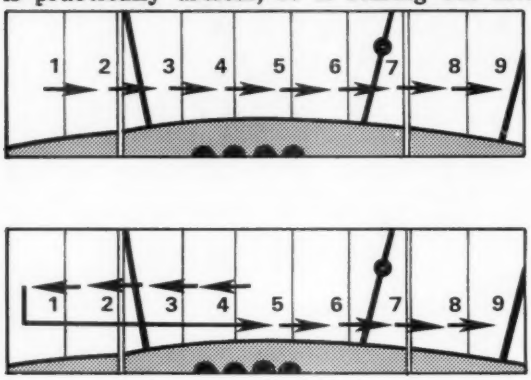


Figure 2.

TOP
Side-to-side scanning method. Start at the far left of your visual area and make a methodical sweep to the right, pausing in each block of viewing area to focus your eyes. At the end of the scan, return to the panel.

ABOVE.
Front-to-side scanning method. Start in the center block of your visual field (center of front windshield); move to the left, focusing in each block, then swing quickly back to the center block after reaching the last block on the left and repeat the performance to the right.

one spot for long periods of time (even though it may be great for meditation).

So much for the bad habits. It would be preferable, naturally, to look everywhere constantly, but that's not practical. So, concentrate on the areas most critical to you at any given time. In the traffic pattern, clear yourself before every turn, and always watch for traffic making an improper entry into the pattern. On descent and climbout, make gentle S-turns to see if anyone is in your way. (Make clearing turns, too, before attempting maneuvers.) During that very critical final approach stage, don't forget to look behind and below. For heavy drivers, this is where the crew concept comes in and you can use scanners, loadmasters, etc., to help you clear your "six." Above all, avoid tunnel vision.

In normal flight, you can generally avoid the threat of an in-flight collision by scanning an area 60° to the left and right of your center visual area. This doesn't mean you should forget the rest of the area you can see from your side windows every few scans. Vertically, the statisticians say you'll be safe safe if you can scan 10° up and down from your flight vector. (See Fig. 1). This will allow you to spot any aircraft at an altitude that might conflict with your own flight path; whether it's level with you, below and climbing, or above and descending.

The slower your plane, the greater your vulnerability; hence, the greater scan area required. But don't forget that your eyes are subject to optical illusions and can play some nasty tricks on you. At one mile, for example, an aircraft flying below your altitude will appear to be above you. As it nears, it will seem to descend and go through your level, yet, all the while it will be straight and level below you. One inflight collision occurred when the pilot of the higher flying aircraft experienced this illusion and dove his plane right into the path of the aircraft flying below.

Though you may not have much time to avoid another aircraft in your vicinity, use your head when making defensive moves. Even if you must maneuver to avoid a real inflight collision, consider all the facts. If you miss the other aircraft but stall at a low altitude, you're still dead!

Scan Patterns

Your best defense against inflight collisions is an efficient scan pattern. One basic scan that has worked well for most pilots is called the "block" system. This type of scan is based on the theory that traffic detection can be made only through a series of eye fixations at different points in space. Each of these fixes becomes the focal point of your field of vision (a block 10-15° wide). By fixating every 10-15°, you should be able to detect any contrasting or moving object in each block. This gives you 9-12 "blocks" in your scan area, each requiring a minimum of one to two seconds for accommodation and detection.

One method of block scan is the "side-to-side" motion. Start at the far left of your visual area and make a methodical sweep to the right, pausing in each block to focus. At the end of the scan, return to the panel.

The second form is the "front-to-side" version. Start with a fixation in the center block of your visual field (approximately the center of the front windshield in front of the

pilot). Move your eyes to the left, focusing in each block, swing quickly back to the center block, and repeat the performance on the right. (See Fig. 2.)

There are other methods of scanning, of course, some of which may be as effective for you as the two preceding ones. Unless you periodically stop and focus, however, there is little likelihood that you will be able to detect all targets in your scan area. When the head is in motion, vision is blurred and the mind will not register targets as such.

The Time-Sharing Plan

External scanning is just part of the pilot's total eyeball job. To achieve maximum efficiency in flight, you have to establish a good internal (panel) scan as well and learn to give each its proper share of time. The amount of time one spends eyeballing outside the cockpit in relation to what is spent inside depends, to some extent, on the workload inside the cockpit and the density of traffic outside. Generally, the external scan will take about three to four times as long as a look-around the instrument panel.

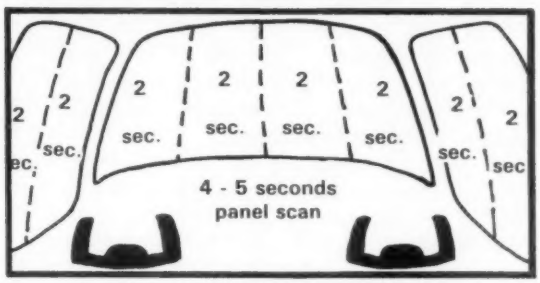


Figure 3. Scan Pattern Time Allocation

McDonnell-Douglas recently conducted an experimental scan training course, using military pilots ranging in experience from 350 to over 4,000 hours. They discovered that the average time needed to maintain a flight situation status quo was three seconds for panel scan, and 17 seconds for outside.

Collision Avoidance Checklist

Collision avoidance involves much more than proper eyeball techniques. You can be the most conscientious scanner in the world and still have an inflight collision if you neglect other important factors in the overall see-and-avoid picture. It might be helpful to use a collision avoidance checklist as religiously as you do the pretakeoff and landing checks. Such a checklist might include the following nine items.

- **Check Yourself**—Start with your own physical condition. Your eyesight, and consequently your safety, depend on your mental and physical condition.
- **Plan Ahead**—Plan your flight ahead of time. Have charts folded in proper sequence, and keep the cockpit free of clutter.
- **Have the Windows Cleaned**—Have the crew chief, flight engineer or someone make sure the windows are spotless before *every* flight.
- **Adhere to the Regs**—This one is self explanatory.
- **Avoid Crowds**—If it is possible to stay away from the more highly congested areas during their peak "rush hours," then do it.
- **Compensate for Design**—You and your stan-eval folks know the good points and the bad points of your aircraft's design. For example, a high wing aircraft that has a wing down in a turn blocks the area you are turning into. A low wing blocks the area beneath you. And one of the most critical midair potential situations is a faster low-wing plane overtaking and descending on a high wing on final approach.
- **Equip for Safety**—Make sure all the strobes, rotating beacons, and transponders are operable before and during flight.
- **Listen, Then Talk**—Use your radios as well as your eyes. Keep a "listening watch" for the locations of other aircraft, and when in doubt, query the controller for a potential aircraft's position.
- **Scan!**—The most important part of your checklist, of course, is to keep looking where you're going and to watch for traffic. Basically, if you adhere to good airmanship, keep yourself in good condition, and develop an effective scanning system, you'll have no trouble avoiding in-flight collisions. And as you learn to use your eyes properly, you'll benefit in other ways. Remember, despite their limitations, your eyes provide you with color, beauty, shape, motion and excitement. As you train them to spot minute targets in the sky, you'll also learn to see many other important "little" things you may now be missing, both on the ground and in the air. If you couple your eyes with your brain, you'll be around to enjoy these benefits of vision for a long time.

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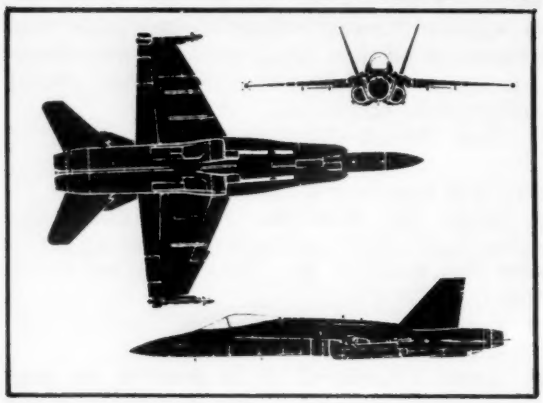


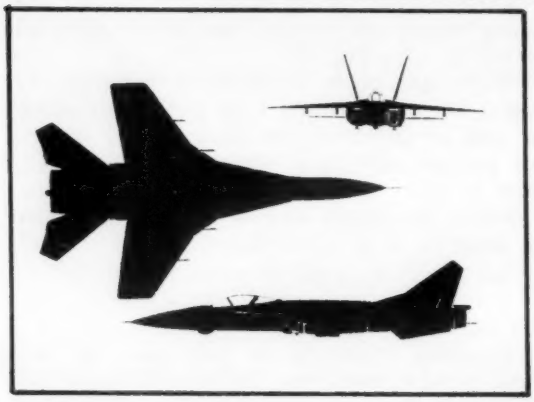
McDonnell-Douglas F/A-18 Hornet

Carrier qualified, the Hornet is capable of Mach 1.8, and more than Mach 1 at military power. The twin General Electric F404-GE-400 low bypass turbofans produce 16,000 pounds of thrust each. Its radar can track 10 targets simultaneously, and the F/A-18 will carry AIM-7s and AIM-9s. With the internally mounted M-61 20 mm gun and the missiles, the Hornet is a lethal air-to-air weapons platform.

Typical identification features include its mid-mounted straight wing with missile pylons on each tip. The twin vertical stabilizers are swept and tapered, and are mounted on the fuselage. Upon first glance, the Hornet can easily be mistaken for its bigger Navy brother, the F-14 Tomcat, and with its St. Louis-bred stablemate, the F-15 Eagle. There is also a two-seat version of the Hornet.

Besides the US, Hornets are, or will also be displaying the colors of Canada, Australia and Spain.

Wing Span	37½ feet (11.43m)
Length	40 feet, 4 inches (12.31m)
Height	15¼ feet (4.66m)
Loaded Weight	33,585—47,000 pounds
Ferry Range	2,000 nm+



MiG-29 FULCRUM

As long ago as 1979, there were reports of a new Soviet fighter coming from the USSR's ultra-top secret test facility at Ramenskoye. Then known as Ram-L, and since given its official NATO designation of "Fulcrum," the MiG-29 is in the same class as the F/A-18 and is considered to be an air superiority fighter. Details of the new fighter are still highly provisional, and the accompanying three-view depiction is based on reliable sources.

Outwardly resembling the Hornet, Fulcrum looks to be of a similar size and weight, though each engine is thought to produce some 3,000 pounds of thrust more than the Hornet's GE F404s. Armament probably includes an internally mounted 30 mm gun and up to eight air-to-air missiles. Fulcrum also has on board a "look down/shoot down" radar. Washington sources quote an instantaneous turn rate of about 16.8°/second and sustained turn rate of 8.26°/second.

Recognition features are almost identical to the McDonnell-Douglas F/A-18 Hornet, so take a close look at your new wingman before you start calling "bandits."

Wing Span	36 feet (11.0m)
Length	54 feet (16.5m)
Weight	37,500 pounds (approx)

C.R. TERROR

The Field-grade Fumbler enters the computer age.

C.R. held the gleaming metallic box in his chubby hands and beamed happily. "It's perfect, Bud! Exactly what I ordered. Now, wrap up those four mini-monitors and I'll be on my way. I can't wait to give this system a thorough shakedown."

"Okay by me, Major Terror," the 17 year-old owner and proprietor of "Bud's Computer Haven" (better known as the Baudy House) replied as he instantly calculated the bill for the Baron of Bytes. "That comes to exactly $1,324.018963. Since you're a good customer, make it $1,324 even."

The Ace of Automation quickly scrawled out an illegible check and handed it to the teenaged computer whiz. "Here y'are, m'lad, and thanks for all the work on this *experimental* program I requested for my crew." Quickly, he scooped up his newly-acquired "RAM-Slammer" mini-computer and headed to his decrepit green E-type Jag in the parking lot. Following in C.R.'s wake, Bud staggered along under a pile of mini-monitors, instruction manuals and a sale-priced "Orangutan" ink-jet printer. It was mid-December 1984 and C.R. Terror was about to enter the computer age—feet first and blindfolded.

"Good morning, gang!" the Raconteur of ROM boomed as his bleary-eyed crew seated themselves in the squadron briefing room. "I know it's 0330 and I've asked you to show up two hours early to brief this local, but there's method to my madness."

"Always is, always is," Ty Downs muttered under his breath as he struggled to stay awake.

C.R. ignored the mutterings of his near-mutinous crew. "Egads, m'lads! Today will go down in aviation history. We're gonna move Mother MAC into the Twenty-Second Century!"

His stalwart crew instantly came to full consciousness as they glanced warily at each other. When the Master Manipulator had delusions of grandeur, it was time to pay attention and check six—often!

"Max, Ty, Blinky, Sammy, you'll be pleased to know that our trusty Galaxy is already preflighted and ready to go. All we gotta do is grab a bite of breakfast and catch the crew bus out to our waiting air machine." Noting his crew starting to fidget and cough nervously, he continued. "I know this

sounds a little non-standard, gang, but I assure you that all is well. Remember that fabulous Christmas present I promised you if I survived that last FEB? Well, this is it."

"But, Boss," Sammy interrupted. "We all told the truth to the board. They said they couldn't reach a verdict because somehow the aircraft forms were totally destroyed in the pan of flaming 'cherries jubilee' you were preparing at FL 370 over the mid-Atlantic.

"Er, perhaps I misspoke,

Sammy" the Fibbing Flyboy ad libbed. "I've been program... er, planning this Christmas present for months. C'mon, let's eat and get out to the aircraft. I can't stand the suspense much longer." In a flash, C.R. was down the hall and first in line at the flight line snack bar.

"Blinky, I think it's gonna be a long day!" Sammy said gloomily. "I know the Boss is up to something, and I'm not sure I want to know what."

An hour later, C.R. led his apprehensive crew up the C-5's flight station ladder. *"Phew, gasp, wheeze!* Why didn't somebody invent an escalator for the Galaxy? By the time I get to the cockpit, I'm too tired to fly. Are ya doin' OK with my helmet bag and briefcase, Sammy?" he asked charitably, always concerned with his crew's well-being.

"Just fine, Boss," the always competent copilot panted. "After dragging this briefcase up these steps, I'll be able to scratch my knees without bending over." C.R. ignored the remark.

"Boss, what the heck's under those brown paper bags and what are all those wires and cable doing on the floor? Are we on the right aircraft?" Max voiced the questions on the tongues of the entire crew.

The Misprogrammed Pilot drew himself up to his full height (five feet six inches, on a good day) and cleared his throat. "Ahem. Gentlemen, what lies before you will make history in MAC and the Air Force. May I present the Christmas present every MAC crewmember will want—the first production model of the *C.R. Terror Flight Management and Intercrew Data Processing System*, better known as FMAIDPS." He glanced around at the stunned faces of his crew and chortled. "Well, don't just stand there. Remove those paper bags and take a look. Ty, yours is on the table in the aft flight deck."

Slowly, and with great trepidation, C.R.'s crew slid into their seats and uncovered their mini-monitors.

"OK, Boss, I give up!" Blinky finally exclaimed. "What is it and what does it do?"

C.R. swiveled in his seat and held out a small, metallic box with a miniaturized keyboard on top. Coming from the rear of the box was a maze of colored wires and cables which ran throughout the cockpit and on to the relief crew compartment.

"This is my very own 'RAM-Slammer' mini-computer and it's going to revolutionize the concept of crew coordination. Not only are all your checklists programmed in here," he said pointing to an integral dual-disc drive, "but the entire system is voice operated. All you gotta do is speak into that small mike on the top of your monitor and the computer will do the rest. By the way, the computer responds to the name of 'RAM-Slam.' Watch!" The Legend of Loops leaned over his monitor. "RAM-Slam, figure takeoff and landing data—gross weight 550,000 pounds, temp +15° C., winds 150 at 10, and pressure altitude of +150. We'll use runway 13."

Seconds later, the monitor at the engineer's station lit up and a

completed TOLD card appeared on the screen. "Well, I'll be hanged!" Max snorted in grudging admiration. "That's exactly what I figured at base ops."

"Why, of course, Max," C.R. laughed. "But it took 'RAM-Slam' only 2.1 seconds to figure the data. What did it take you—30 minutes?"

Sammy couldn't contain himself any longer. "RAM-Slam, display the cruise checklist." He smiled in delight as the checklist immediately appeared on his monitor. The other crewmembers quickly noticed that their portions of the checklist were also displayed at their positions.

"Hey, Boss, this is really neat!" Blinky chuckled happily, evidently pleased with another electronic gadget to occupy his time inflight. "But don't you suppose we should put this stuff away? We're scheduled to take off in 40 minutes."

"Negatory, Blinky m'boy. I've personally supervised the construction of this program, and I guarantee it's foolproof. You won't even have to touch your checklists or Dash-Ones during this local. We can verify the worth of this set-up in one flight and MAC will probably implement it command-wide within six months." Brushing aside his crew's howls of protest that no one had authorized a test of the "RAM-Slam," C.R. uttered the fateful words. "RAM-Slam, Before Starting Engines checklist."

Moments later, the crew completed the checklist, the computer instantly pointing out C.R.'s non-standard checklist responses. "RAM-Slam, Starting Engines checklist," C.R. said to the computer as he prepared to fire up the Galaxy's number-one engine. "Starting number-one," the Computerized Commander stated as he mashed the starter button.

"Stop start!" Max interjected almost immediately. "I've got a malfunction warning flashing on my screen. Uh, Boss, this display says we've got an APU fire, but it doesn't show on my APU control panel. What do you want me to do?" Max waited, then looked at the computer screen for guidance.

"Uh, well...I guess a computer can't lie, so we've obviously got an APU fire. Must be a malfunction in the fire warning system. Go ahead and discharge the fire bottle. Call for the fire equipment, Sammy!"

"Boss, my screen says fire on number four engine," Blinky yelled unexpectedly. "What's going on? We haven't even *started* engines yet."

"I've got an oxygen warning on my screen, Sammy interrupted. "RAM-Slam says he deployed the masks in the troop compartment."

The warnings increased in severity and frequency and the crew spent the next five minutes in near panic as they responded to the multiple emergencies. Then the screens all went blank. Slowly, another message appeared, identical on all the screens. It said simply, "Congratulations, you've just passed the emergency procedures portion of your annual simulator check. Push reset to continue with the mission."

"Argh!" C.R. wailed in anguish. "Now I know how that kid wrote this program so fast. He tapped into the simulator computer. There's absolutely nothing wrong with this aircraft. I've been had—$1,324 worth of junk." He began to sob quietly.

"Uh, Boss, I hate to interrupt," Max said quietly. "But do you suppose RAM-Slam could come up with a believable excuse for this fiasco?"

Dimly, the screen in front of Max flickered to life and a wavering message appeared. "Merry Christmas!" was all it said.

Chug-A-Lug

A Sabreliner's mysterious and nearly insatiable thirst for engine oil recently caused some anxious moments for its crew. Level at FL 390, approximately 45 minutes after departure, the CT-39 crew noted the right engine oil pressure was fluctuating from 45 psi to 20 psi, then returning back to 45 psi. This fluctuation pattern repeated itself every 30 seconds and was accompanied by momentary illumination of the oil pressure low light and master caution light. Concerned by the indications, the crew shut down the engine and diverted to a nearby Sabreliner base. Maintenance soon found the cause—the engine contained only two quarts of oil (normal capacity is five quarts). The mystery deepened when the crew called the departure base and was told the engine had been checked and serviced while the aircraft was there. After refilling the oil and rechecking all the connections, maintenance performed an oil consumption run. The engine checked out normally, so the aircraft was released for flight and returned to its home station. Strange!

Touching Tips

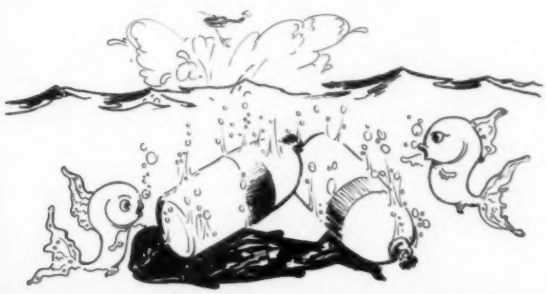
It was to be a 2130 local departure for the crew of the camouflaged Starlifter and they were comfortably ahead of schedule. Engines started, marshalling crew in place and a scanner in each cockpit side window, the AC was ready to go. The C-141 rolled straight ahead for approximately 20-30 feet, only to be stopped when the right wingtip marshaller judged inadequate clearance between the blocking aircraft and one parked on an adjacent spot. Deciding a left turn would provide proper clearance, the block-out crew signalled the aircrew accordingly. The Starlifter then began a slow left turn when, due in part to wingtip radius growth, the two aircrafts' wingtips came even closer. Realizing a *real* hazard existed, the right wing marshaller again signaled for a stop—a decision echoed by the scanner in the C-141's right window. The AC immediately applied brakes and stopped (again) and deplaned the scanner to check it out. The scanner discovered the two wingtips were indeed very close, in fact, within *one inch* of each other. (Actually, they had scraped, causing only very minor damage to each.)

Why did this happen? Well, C-141 parking was saturated at the base, so Starlifters were parked on spaces marked for KC-135 aircraft which have a somewhat smaller wing span. Other factors contributing to this incident included a dark, poorly lighted ramp and nonstandard block-out procedures.

Cleared For What?

Distraction and a failure to pay attention recently resulted in acute embarrassment for a C-141 crew and the controllers in a USAF tower. Unfortunately, there was a third group involved, a barrier maintenance team, and they weren't embarrassed, just terrified.

The Starlifter crew was on a local training mission, flying at a USAF base near their homedrome. After completing a precision approach to a low approach (a *restricted* low approach due to barrier maintenance in progress), the Starlifter IP asked for vectors to an ILS touch-and-go. At about a five-mile final, the C-141 was cleared for a restricted low approach due to the crew working on the barrier. The IP acknowledged the low approach and voiced concern over two hot-air balloons drifting into the clouds in the vicinity of radar downwind. The C-141 then continued the approach and accomplished a touch-and-go, much to the surprise and dismay of the barrier crew working at the departure end of the runway! Luckily for all, there was no damage and no one was hurt in this incident—one which *never* should have occurred.



Tanks for the Memories

A UH-1N graphically demonstrated its ability as a low-altitude bomber in an incident which occurred last summer. The helicopter was carrying a sling load of double scuba tanks in support of an exercise with another country and was cruising at 1,000 feet AGL. When the IP in the left seat keyed his floor mike to transmit on HF, the load of tanks suddenly dropped into the ocean! The ensuing investigation revealed the cargo release system is not shielded against stray RF signals which can, under the right circumstances, actuate the cargo release solenoid, thereby causing the load to drop. Stray electrons strike again!

Not A Statue

Everyone is aware of the damage a flock of pigeons can do to a statue in the park. Disgusting!! But have you ever wondered what kind of damage that same flock of pigeons can do to an aircraft? The crew of a C-141 got their answer recently on a trip to RAF Mildenhall. The Starlifter was on short final, approximately 100 AGL, when it was struck by a flock of "large" birds, later identified as pigeons. The crew completed the landing without incident, then turned the aircraft over to maintenance. Their inspection revealed one or more birds had struck the radome squarely in the middle, while another had impacted the T-tail. The radome suffered an 18 by 24 inch soft spot and had to be replaced. The pigeons didn't fare so well, either.

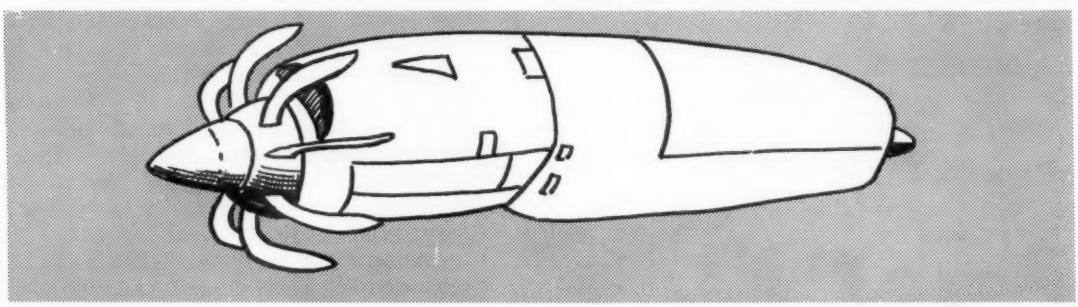
After Deadlines

MAC AIRCREWS AID SHUTTLE EXPERIMENT—Aircrews and C-141s from three MAC wings contributed to the latest successful flight of the space shuttle Challenger. The C-141s from Norton AFB, California, Charleston AFB, South Carolina, and McGuire AFB, New Jersey, helped test the capabilities of the Challenger's most heralded piece of high technology, the Shuttle Imaging Radar, known as the SIR-B. The MAC crews flew their C-141B Starlifters to precise, predetermined points within seconds of a target time. Challenger, passing in orbit hundreds of miles overhead, simultaneously used the high resolution radar aboard to identify, and then capture on film, the cargo jet's images. At the time of each rendezvous, Challenger was racing around the earth at nearly 18,000 mph., making the aircrew's job of precision flying even more crucial. The scientists involved in the complex undertaking praised the professionalism and skill of all MAC participants.

HH-53H PAVE LOW HELICOPTER CRASHES NEAR CLARK AB—On 17 October, an HH-53H from the 1st SOW, Hurlburt Field, Florida, crashed while participating in a Cope Thunder exercise near Clark AB, Republic of the Philippines. The helicopter was on a terrain-following mission when the accident occurred, killing all six of the crewmembers on board.

***TMF* CORRECTION**—The October Instrument Quiz contains an incorrect answer to question number eight. Letter "a" should be listed as the correct answer. The explanation remains correct.

LOCKHEED-GEORGIA WINS PROPFAN CONTRACT FLIGHT TEST OPTION—The National Aeronautics and Space Administration has exercised the $19 million flight test option to the Propfan Test Assessment (PTA) contract it awarded Lockheed-Georgia company recently, bringing the firm contract amount to $59.3 million. Flight testing will validate proof of concept for the propfan. It also will extend the original three-year Propfan Test Assessment program an additional year. The now-funded flight test phase of the PTA program is scheduled to begin in mid-1987, with tests at speeds up to mach 0.8 (550 m.p.h.) and altitudes up to 35,000 feet. Propfan is an advanced propeller design featuring scimitar-like thin profile blades with highly swept tips. Fuel savings of 20 to 35 percent are possible with propfan while flying at jet speeds.



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WIND CHILL CHART

Wind Speed		Cooling Power of Wind Expressed as "Equivalent Chill Temperature"																				
	MPH	Temperature (°F)																				
Calm	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	-55	60
		Equivalent Chill Temperature																				
3.6	5	35	30	25	20	15	10	5	-5	-10	-15	-20	-25	-30	-35	-35	-40	-45	-50	-55	-65	-70
7.10	10	30	20	15	10	5	0	-10	-15	-20	-25	-35	-40	-45	-50	-60	-65	-70	-75	-80	-90	-95
11.15	15	25	15	10	0	-5	-10	-20	-25	-30	-40	-45	-50	-60	-65	-70	-80	-85	-90	-100	-105	-110
16.19	20	20	10	5	0	-10	-15	-25	-30	-35	-45	-50	-60	-65	-75	-80	-85	-95	-100	-110	-115	-120
20.23	25	15	10	0	-5	-15	-20	-30	-35	-45	-50	-60	-65	-75	-80	-90	-95	-105	-110	-120	-125	-135
24.28	30	10	5	0	-10	-20	-25	-30	-40	-50	-55	-65	-70	-80	-85	-95	-100	-110	-115	-125	-130	-140
29.32	35	10	5	-5	-10	-20	-30	-35	-40	-50	-60	-65	75	-80	-90	-100	-105	-115	-120	-130	-135	-145
33.36	40	10	0	-5	-15	-20	-30	-35	-45	-55	-60	-70	-75	-85	-95	-100	-110	-115	125	-130	-140	-150

Winds Above 40 Have Little Additional Effect	Little Danger	Increasing Danger (Flesh may freeze within 1 min.)	Great Danger (Flesh may freeze within 30 seconds)

Danger of Freezing Exposed Flesh